Review Article

Transoral thyroidectomy: why is it needed?

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Abstract: Transoral thyroidectomy (TOT) represents reasonably the desirable minimally invasive approach to the gland due to the scarless non-visible incisions, the limited distance between the gland and the access that minimize tissue dissection and respect of the surgical anatomical planes. Patients are routinely selected according to an extensive inclusion criteria: (I) ultrasonographically (US) estimated thyroid diameter not larger than 10 cm; (II) US gland volume ≤45 mL; (III) nodule size ≤50 mm; (IV) a benign tumor, such as a thyroid cyst, single-nodular goiter, or multinodular goiter; (V) follicular neoplasm; (VI) papillary microcarcinoma without lymph node metastasis. The operation is realized through median, central approach which allows bilateral exploration of the thyroid gland and central compartment. TOT is succeed both endoscopically adopting ordinary endoscopic equipments or robotically. In detail three ports are placed at the inferior oral vestibule: one 10-mm port for 30° endoscope and two 5-mm ports for dissecting, coagulating and neuromonitoring instruments. Low CO_2 insufflation pressure is set at 6 mmHg. An anterior cervical subplatysmal space is created from the oral vestibule down to the sternal notch, laterally to the sterncleidomuscles similar to that of conventional thyroidectomy. TOT is now reproducible in selective high volume endocrine centers.

Keywords: Endoscopic thyroidectomy; robotic thyroidectomy; transoral thyroidectomy (TOT); natural orifice transluminal endoscopic surgery (NOTES)

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Endoscopic thyroidectomy has been carefully investigated since 2008 with a natural orifice transluminal endoscopic surgery (NOTES) throughout a sublingual, or via a trans-tracheal approach in order to perfect cosmesis, which is an entire scarless benefit in the skin (1-4).

The sublingual and the trans-tracheal approaches, originally performed in Germany, were discontinued after experimental and few clinical studies because of tissue bruise, organ damage, complications, laryngeal nerve injuries, restrictive surgical view and safeness, conversion, unavailability of instrumentation and difficulties due to limitation of instrumentation movement (1-5).

Table 1 Features of the transoral *sublingual* access to the thyroid gland. This approach has been abandoned

Sublingual access
Advantages
Closer to thyroglossal duct
Slight less longer approach to reach the gland
No mental nerve injury
Disadvantages
Severe tissue and organ damage
High complication rates
Conversion rates
Limitation of instrument movement
No instrument availability
Small number patients

Table 2 Prominent characteristics of transoral thyroidectomy via vestibular approach

Cosmetic surgery: no cutaneous visible scar
Broad inclusion criteria
Minimally invasive surgery: avoids remote surgical access, minimize surgical trauma and excessive tissue dissection, respects anatomical planes
Median central approach: facilitate and achieve bilateral revelation of the thyroid gland, laryngeal nerves, parathyroid gland and of the central compartment.
Better evaluation of the central compartment and pyramidal lobe than in BABA or axillary approaches. Less flap dissection than axillary, BABA or retroauricular approach
Minimize RLN traction by a cefalo-caudal dissection
The benefits of NOTES
Feasible with both conventional endoscopic instruments and robot assisted
Reliable postoperative course
Technique is reproducible in many centers

BABA, bilateral axillary breast approach; RLN, recurrent laryngeal nerve; NOTES, natural orifice transluminal endoscopic surgery.

Table 1 constitutes a summary of the advantages and disadvantages of the transoral gland removal via the sublingual approach (1-4).

In 2013 a new NOTES procedure with an inferior 3-incision vestibular approach has been popularized for thyroid gland surgery in Thailand (5).

Figure 1 Transoral left thyroid lobectomy for a 3 cm, Bethesda III lesion. Cosmetic outcome at 4th postoperative day.

Prominent characteristics of transoral thyroidectomy (TOT) via three vestibular approaches are summarized in *Table 2* and here below detailed presented.

Cosmesis

The main benefit and indication for TOT is the cosmetic result. Given the preeminence of thyroid surgery in young female patients, consideration should be given to reduce to the smallest as possible the invasiveness of the surgical procedure, secrete scars, that is improve cosmesis and the appearance of Patient after surgery (5). Cosmetics concerns, discussions and request, debated are a matter of some uncertainly, difficulty and frequently demanded from young woman and man and their partners, husbands, in the day life activity and work (5,6). Conventional thyroidectomy surgery include a transverse cervical incision, at least 3 cm long, that determine an appreciable mark left by healed wound (5). TOT in comparison to both conventional and other endoscopic thyroidectomy has the advantage of no visible incision in the skin, in the neck, and/or in other areas of the patient body (5-7). The three surgical incisions are weaved in the vestibular, lower lip. As a consequence, no physical or physiological complication related to scar as keloid, hypertrophic scar, contracture formation, dehiscence (8-10) (*Figure 1*).

Thus, the main usefulness of TOT is the extraordinary cosmetic result with no scar and possible emotional benefit and reassure (11,12).

Extensive inclusion criteria

TOT convoy a strict, precise yet wide inclusion criteria, i.e.,

Table 3 Non preferred candidates for transoral approach

Poorly differentiated or undifferentiated cancer
Posterior extrathyroidal extension
N1b
Huge goiter
Graves' disease
Previous neck surgery

(I) a preoperative ultrasonographically (US) estimated gland size <10 cm; (II) thyroid volume ≤45 mL; (III) dominant nodule size ≤50 mm; (IV) a benign lesions, like thyroid cyst, single-nodular goiter, or multinodular goiter; (V) Bethesda 3 or 4 lesion; (VI) papillary microcarcinoma without any evidence of metastasis (5-16).

The inclusion criteria are certainly broader than the other endoscopic or robotic procedures (5).

Exclusion criteria comprise patients who (I) are unfit for surgery; (II) cannot tolerate general anesthesia; (III) had antecedent radiation in the area of the head, neck and/or upper mediastinum; (IV) had previous neck surgery; (V) recurrent or huge goitre; (VI) thyroid gland volume >45 mL; (VII) dominant nodule size >50 mm; (VIII) evidence of lymph node or distant metastases; (IX) tracheal/esophageal invasion; (X) preoperative recurrent laryngeal nerve palsy (m) biochemical or US signs of hyperthyroidism and (XI) oral abscesses (5-16) (*Table 3*).

Minimally invasive procedure

In thyroid surgery, a minimally invasive surgery may be delineated by the length, site and total number of wounds, by the extent needed for careful and shortened dissection to extend in operation to the cervical area, the neck, the thyroid and parathyroid glands and the central compartment, reducing to the smallest as possible amount the tissue and organ trauma, maintaining safe visualization and exposure of the laryngeal nerves, the use or not of a videoscope and CO_2 insufflation, enhancing cosmesis, the use of regional anesthesia, a painless procedure, duration of thyroidectomy or by an outpatient care setting (5-16).

The appellation of "minimal access" and "minimally invasive" are definitely not coincident in endocrine surgery (5-7). The MIVAT procedure is a minimally invasive because the surgical access is direct in the neck, with smaller extent of dissection and good cosmesis (9,12). Remote extracervical endoscopic thyroidectomies as the bilateral axillary breast approach (BABA) or the axilla approaches maybe not minimally invasive as the area of surgical division is considerable (ports are far away from thyroid and this require a significant degree of operation) (5,13). MIVAT and extracervical thyroidectomies present discrete advantages, although none of them completely avoids a cutaneous scar in the neck, chest, breast or axilla area (6,7,10-16).

TOT is a minimally invasive procedure as its vestibular access is near to the thyroid gland, the length of dissection guarantee less operation (5). The route, the way, the approach to the anterior neck is close, shorter than that from the axilla, or breast, or retroauricular (13-16). The transoral approach respects surgical anatomical subplatysmal planes (5). The flap dissection is similar to that of conventional surgery (16).

TOT preserve bilateral gland exploration

TOT is through a central-median approach, thus it provides the required secure bilateral view and exposure of thyroid gland and the two-sided procedure can be perform in safety without additional incisions (16).

Differently other endoscopic and robotic-assisted approaches that have a lateral remote access (as in the axilla, or retroauricular), TOT approach provides a midline access and main laid line exposure to the isthmus, both the right and left thyroid lobes in their completeness (superior and inferior pole, posterior gland), pyramidal lobe, the two inferior laryngeal nerves and superior laryngeal nerves, parathyroid glands and the lymph nodes in the central compartments, level 6 around the RLNs, trachea and esophagus (7,9). Central compartment inspection, dissection with complete lymphadenectomy was described and is feasible and safe (5-16).

TOT represents an appreciable opportunity over the other remote techniques (transaxillary BABA), in which approaching the contralateral thyroid lobe, central compartment lymph nodes and pyramidal lobe is actually demanding even for the experienced surgeon (12).

The sight from the 30° HD endoscope during the transoral approach, is cranial to caudal, and this is a well-acquainted frame for the surgeon routinely involved in conventional thyroid surgery for identifying the laryngeal nerves, parathyroids glands and provides excellent exposure, allowing a complete central neck dissection (12,13).

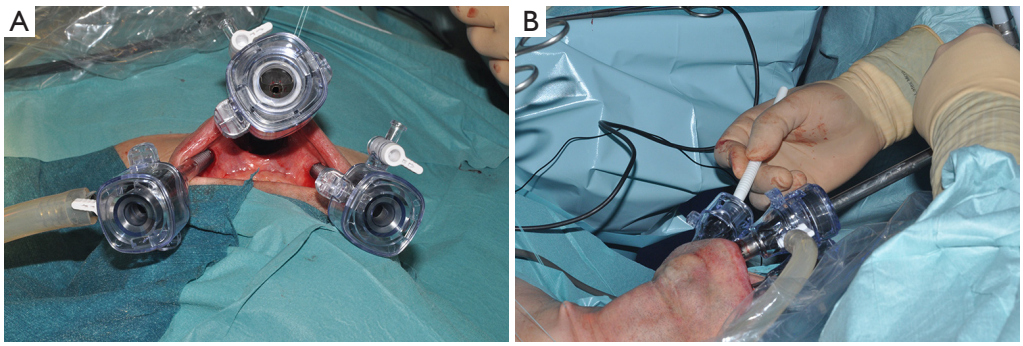

Figure 2 Transoral thyroidectomy with conventional endoscopic instrumentations.

Table 4 Transoral thyroidectomy: postoperative care

Postoperative care
Oral antibiotics for 5–7 days
Mouthwash 3 times per day for 5–7 days
Oral diet on day 0 postoperatively (evening)
Patients are mobilized from bed 4 hrs postoperatively
Patients can take a shower and man shave on day 0 postoperatively (evening)
Patients can sunbathe on the following weekend

Feasible with both conventional endoscopic and robot instrumentation

Robotic surgery is now well established in neck thyroid surgery with significant advantages, as for the more precise dissection, no tremor, perfect vision quality with 3D HD monitors, curved instruments, less collision with arms, counter traction by the additional 4th axilla port and larger specimens removal.

However, Robot is not yet executed widely because of obstacles in the economy (5). The robotic technology is at the present time accessible for a confined number of Hospitals especially in the USA, Asian Countries as the Republic of Korea, few European Institutions (5).

The rating use of routine conventional laparoscopic endoscopic instrumentation for TOT seems to be a more feasible option for wide adaption of this new technique (6). TOT can be carried with or without the aid of the robot, and safely with only the use of conventional endoscopic instruments (*Figure 2*). De facto, TOT is done fully endoscopically using conventional endoscopic instruments with less overall operative time (14).

Reproducibility

TOT is currently multi-institutional, internationally performed in Asia, Europe, Latin America and USA. TOT is being embraced by several high volume experienced centers as in Thailand (40 centers), South Korea (3 centers, robotically), India, China (2 centers), Singapore, Taiwan (20 centers), USA (7 centers), Mexico, Japan, Ecuador and Italy (16).

Surgeons now performing TOT are expertise with profound background of endocrine diseases, conventional thyroidectomy, endoscopically and robotic procedures, this is a prerequisite for a safe introduction of TOT (5).

Reliable postoperative course

Postoperative course of TOT is reliable and steady (*Table 4*). For TOT, no dressing is required. No skin wound care is necessary. Oral antibiotics and mouthwash 3 times per day are prescribed for 3–5 days (5). Patients are mobilized from bad at +4 hrs postoperatively (5). Most patients start an oral soft diet on day 0 on same evening of surgery (5). Patients can have a shower in the evening and men can shave. Patients can sunbathe on the following weekend (5). Discharge from hospital are dictated by the common rules of the thyroid surgery, after careful evaluation by the surgeon, endocrinological and anesthesiological specialist, serum calcium dosage and after neck, mouth, vestibule and laryngoscopy to evaluate the RLNs function (5).

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

References

1. Witzel K, von Rahden BH, Kaminski C, et al. Transoral access for endoscopic thyroid resection. Surg Endosc 2008;22:1871-5.
2. Benhidjeb T, Wilhelm T, Harlaar J, et al. Natural orifice surgery on thyroid gland: totally transoral video-assisted thyroidectomy (TOVAT): report of first experimental results of a new surgical method. Surg Endosc 2009;23:1119-20.
3. Wilhelm T, Metzig A. Video. Endoscopic minimally invasive thyroidectomy: first clinical experience. Surg Endosc 2010;24:1757-8.
4. Wilhelm T, Metzig A. Endoscopic minimally invasive thyroidectomy (eMIT): a prospective proof-of-concept study in humans. World J Surg 2011;35:543-51.
5. Anuwong A. Transoral Endoscopic Thyroidectomy Vestibular Approach: A Series of the First 60 Human Cases. World J Surg 2016;40:491-7.
6. Liu E, Qadir Khan A, Niu J, et al. Natural Orifice Total Transtracheal Endoscopic Thyroidectomy Surgery: First Reported Experiment. J Laparoendosc Adv Surg Tech A 2015;25:586-91.
7. Woo SH. Endoscope-assisted transoral thyroidectomy using a frenotomy incision. J Laparoendosc Adv Surg Tech A 2014;24:345-9.
8. Benhidjeb T, Stark M. Endoscopic minimally invasive thyroidectomy (eMIT): safety first! World J Surg 2011;35:1936-7; author reply 1938-9.
9. Clark JH, Kim HY, Richmon JD. Transoral robotic thyroid surgery. Gland Surg 2015;4:429-34.
10. Lee HY, Richmon JD, Walvekar RR, et al. Robotic transoral periosteal thyroidectomy (TOPOT): experience in two cadavers. J Laparoendosc Adv Surg Tech A 2015;25:139-42.
11. Lee HY, You JY, Woo SU, et al. Transoral periosteal thyroidectomy: cadaver to human. Surg Endosc 2015;29:898-904.
12. Lee HY, Hwang SB, Ahn KM, et al. The safety of transoral periosteal thyroidectomy: results of Swine models. J Laparoendosc Adv Surg Tech A 2014;24:312-7.
13. Inabnet WB 3rd, Suh H, Fernandez-Ranvier G. Transoral endoscopic thyroidectomy vestibular approach with intraoperative nerve monitoring. Surg Endosc 2017;31:3030.
14. Park JO, Kim MR, Kim DH, et al. Transoral endoscopic thyroidectomy via the trivestibular route. Ann Surg Treat Res 2016;91:269-72.
15. Witzel K, Hellinger A, Kaminski C, et al. Endoscopic thyroidectomy: the transoral approach. Gland Surg 2016;5:336-41.
16. Udelsman R, Anuwong A, Oprea AD, et al. Trans-oral Vestibular Endocrine Surgery: A New Technique in the United States. Ann Surg 2016;264:e13-e16.

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